

CLAIMS

What is claimed is:

1. A trainable transceiver for learning signal characteristics of an RF control signal received from a remote control transmitter used to remotely actuate a device and for subsequently transmitting a modulated RF signal having the learned signal characteristics, the trainable transceiver comprising:
 - an antenna;
 - a wideband receiver coupled to the antenna, the wideband receiver configured to receive an RF control signal from the remote control transmitter, the RF control signal including a control code, a set of data characteristics and an RF carrier frequency; and
 - a control circuit coupled to the wideband receiver, the control circuit having a training mode in which the control circuit is configured to identify and store the control code of the RF control signal, to identify at least one data characteristic from the set of data characteristics and to identify at least one RF frequency associated with the RF control signal based on the at least one data characteristic.
2. A trainable transceiver according to claim 1, wherein the control circuit is further configured to store the at least one RF frequency.
3. A trainable transceiver according to claim 1, wherein the control code is a fixed control code.
4. A trainable transceiver according to claim 1, wherein the control code is an encrypted rolling code and the control circuit is further configured to identify an encryption algorithm based on the at least one data characteristic.
5. A trainable transceiver according to claim 1, wherein the control circuit has an operating mode in which the control circuit is further configured to retrieve the control code and the at least one RF frequency and to generate an RF signal including the control code and the RF frequency.

6. A trainable transceiver according to claim 5, further including a transmitter coupled to the control circuit and the antenna, the transmitter configured to transmit the RF signal to a remotely actuate device.

7. A trainable transceiver according to claim 1, wherein the wideband receiver is a tuned wideband receiver.

8. A trainable transceiver according to claim 1, wherein a plurality of RF frequencies are identified based on the at least one data characteristic.

9. A trainable transceiver according to claim 8, wherein the control circuit is configured to generate an RF signal at each of the plurality of RF frequencies.

10. A trainable transceiver for learning signal characteristics of an RF control signal received from a remote control transmitter used to remotely actuate a device and for subsequently transmitting a modulated RF signal having the learned signal characteristics, the trainable transceiver comprising:

an antenna;

a wideband receiver coupled to the antenna, the wideband receiver configured to receive an RF control signal from the remote control transmitter, the RF control signal including a control code, a set of data characteristics and an RF carrier frequency; and

a control circuit coupled to the wideband receiver and having a training mode in which the control circuit is configured to identify and store the control code of the RF control signal and having an operating mode in which the control circuit is configured to identify at least one data characteristic from the set of data characteristics and to identify at least one RF frequency associated with the RF control signal based on the at least one data characteristic.

11. A trainable transceiver according to claim 10, wherein the control code is a fixed control code.

12. A trainable transceiver according to claim 10, wherein the control code is an encrypted rolling code and the control circuit is further configured to identify an encryption algorithm based on the at least one data characteristic.

13. A trainable transceiver according to claim 10, wherein the control circuit is further configured in the operating mode to retrieve the control code and to generate an RF signal including the control code and the at least one RF frequency.

14. A trainable transceiver according to claim 13, further including a transmitter coupled to the control circuit and the antenna, the transmitter configured to transmit the RF signal to a remotely actuate device.

15. A trainable transceiver according to claim 10, wherein the wideband receiver is a tuned wideband receiver.

16. A trainable transceiver according to claim 10, wherein a plurality of RF frequencies are identified based on the at least one data characteristic.

17. A trainable transceiver according to claim 16, wherein the control circuit is further configured to generate an RF signal at each of the plurality of RF frequencies.

18. A method for training a transceiver to learn a set of signal characteristics of an RF control signal received from a remote control transmitter, the transceiver having an antenna and a wideband receiver, the method comprising:

initiating a training sequence;

identifying and storing a control code of the RF control signal;

identifying at least one data characteristic from a set of data characteristics for the RF control signal; and

identifying at least one RF frequency based on the at least one data characteristic.

19. A method according to claim 18, further comprising storing the at least on RF frequency.

20. A method according to claim 18, wherein the training sequence is initiated in response to the actuation of a switch.

21. A method according to claim 18, wherein the training sequence is initiated when a signal is received by the transceiver.

22. A method according to claim 18, wherein the transceiver is mounted in a vehicle and the training sequence is initiated by a message on a vehicle bus.

23. A method according to claim 18, wherein the receiver is tuned wideband receiver.

24. A trainable transceiver for learning signal characteristics of an RF control signal received from a remote control transmitter used to remotely actuate a device and for subsequently transmitting an RF signal having the learned signal characteristics, the trainable transceiver comprising:

an antenna;

a controllable tuned RF detector coupled to the antenna and configured to receive at least one RF control signal having a frequency in a predetermined range of frequencies;

a controllable frequency generator coupled to the controllable tuned RF detector and configured to generate signals at a plurality of frequencies; and

a control circuit coupled to the controllable tuned RF detector and the controllable frequency generator and configured to identify a control code of an RF control signal received by the controllable tuned RF detector and to provide a test signal to the controllable frequency generator to initiate a testing sequence to determine an RF frequency of the controllable tuned RF detector upon receipt of the RF control signal.